

1           1. In a video management system configured to receive a video stream  
2 containing one or more video pictures that are each divided into blocks, wherein the video  
3 management system is to provide a representation of the one or more video pictures to a  
4 subsample decoder for subsampling, a method of reducing the size of the one or more  
5 frames with minimal, if any, effect on the video quality generated from the one or more  
6 frames after subsampling, the method comprising the following:

7                   accessing a video picture that is to be subsampled; and

8                   for at least one block of the video picture, reducing the size of the block to  
9 generate a reduced size block in such a way that subsampled decoding the reduced  
10 size block results in substantially the same reduced size image as subsampled  
11 decoding the original block.

12  
13           2. The method in accordance with Claim 1, wherein the method further  
14 comprises the following:

15                   providing the video picture with its one or more reduced size blocks to the  
16 subsample decoder.

17  
18           3. The method in accordance with Claim 1, wherein the method further  
19 comprises the following:

20                   subsampled decoding the video picture.

21  
22           4. The method in accordance with Claim 3, wherein the method further  
23 comprises the following:

24                   displaying the subsample decoded video picture on a display device.

1  
2 5. The method in accordance with Claim 3, further comprising the following:

3 displaying the subsample decoded video picture on a display device as a  
4 reduced sized picture of a picture-in-picture display.  
5

6 6. The method in accordance with Claim 1, wherein the act of reducing the size  
7 of the block to generate a reduced size block comprising the following:

8 representing the block as a matrix;

9 pre-multiplying the block matrix by a pre-multiplication matrix, the pre-  
10 multiplication matrix generated from a first subsample matrix that represents the  
11 subsampled decoding in a first direction; and

12 post-multiplying the block matrix by a post-multiplication matrix generated  
13 from a second subsample matrix that represents the subsampled decoding in a second  
14 direction that is substantially perpendicular to the first direction.  
15

16 7. The method in accordance with Claim 6, further comprising:

17 receiving an indication over a network that the subsample decoder is to  
18 operate on the video stream.  
19

20 8. The method in accordance with Claim 6, further comprising:

21 receiving the first and second subsample matrix over a network from the  
22 subsample decoder.  
23

24 9. The method in accordance with Claim 6, wherein the first subsample matrix

1 is a vertical subsample matrix that represents the vertical subsampling that is to be  
2 performed by the subsample decoder, and wherein the second subsample matrix is a  
3 horizontal subsample matrix that represents the horizontal subsampling that is to be  
4 performed by the subsample decoder, the method further comprising the following:

5 generating the pre-multiplication matrix by performing the following:

6 determining a first inverse matrix that represents the multiplication  
7 inverse of a matrix that results from the multiplication of a first transform  
8 matrix times the vertical subsampling matrix; and

9 multiplying the first inverse matrix by the vertical subsampling matrix  
10 to generate the pre-multiplication matrix.

11  
12 10. The method in accordance with Claim 9, wherein determining a first inverse  
13 matrix that represents the multiplication inverse of a matrix that results from the  
14 multiplication of a first transform matrix times the vertical subsampling matrix comprises  
15 the following:

16 determining a first inverse matrix that represents the multiplication inverse of  
17 a matrix that results from the multiplication of a vertical discrete cosign transform  
18 matrix times the vertical subsampling matrix.

19  
20 11. The method in accordance with Claim 9, wherein determining a first inverse  
21 matrix that represents the multiplication inverse of a matrix that results from the  
22 multiplication of a first transform matrix times the first subsampling matrix comprises the  
23 following:

24 determining a first inverse matrix that represents the multiplication inverse of

1 a matrix that results from the multiplication of a vertical wavelet transform matrix  
2 times the first subsampling matrix.

3  
4 12. The method in accordance with Claim 9, further comprising the following:  
5 generating the post-multiplication matrix by performing the following:

6 determining a second inverse matrix that represents the multiplication  
7 inverse of a matrix that results from the multiplication of a second transform  
8 matrix times the transpose of the horizontal subsampling matrix; and

9 multiplying the transpose of the horizontal subsampling matrix by the  
10 second inverse matrix to generate the post-multiplication matrix.

11  
12 13. The method in accordance with Claim 12, wherein determining a second  
13 inverse matrix that represents the multiplication inverse of a matrix that results from the  
14 multiplication of a second transform matrix times the horizontal subsampling matrix  
15 comprises the following:

16 determining a second inverse matrix that represents the multiplication inverse  
17 of a matrix that results from the multiplication of a horizontal discrete cosign  
18 transform matrix times the horizontal subsampling matrix.

19  
20 14. The method in accordance with Claim 12, wherein determining a second  
21 inverse matrix that represents the multiplication inverse of a matrix that results from the  
22 multiplication of a second transform matrix times the horizontal subsampling matrix  
23 comprises the following:

24 determining a second inverse matrix that represents the multiplication inverse of a

1 matrix that results from the multiplication of a horizontal wavelet transform matrix times the  
2 horizontal subsampling matrix.

3  
4 15. The method in accordance with Claim 12, further comprising the following:  
5 horizontal subsampling the video picture using the horizontal subsampling  
6 matrix; and  
7 vertical subsampling the video picture using the vertical subsampling matrix.

8  
9  
10 16. The method in accordance with Claim 1, wherein the at least one block of the  
11 video picture comprises all the blocks in the video picture.

12  
13 17. The method in accordance with Claim 1, wherein the act of accessing a video  
14 picture that is to be subsampled comprises the following:  
15 accessing a video frame that is to be subsampled.

16  
17 18. The method in accordance with Claim 1, wherein the act of accessing a video  
18 picture that is to be subsampled comprises the following:  
19 accessing a video frame that is to be subsampled.  
20

1           19. In a video management system configured to receive a video stream  
2 containing one or more video pictures that are each divided into blocks, wherein the video  
3 management system is to provide a representation of the one or more video pictures to a  
4 subsample decoder for subsampling, a method of reducing the size of the one or more  
5 frames with minimal, if any, effect on the video quality generated from the one or more  
6 frames after subsampling, the method comprising the following:

7                   accessing a video picture that is to be subsampled; and

8                   for at least one block of the video picture, performing the following:

9                           representing the block as a matrix;

10                           pre-multiplying the block matrix by a pre-multiplication matrix, the  
11 pre-multiplication matrix generated from a first subsample matrix that  
12 represents the subsampled decoding in a first direction; and

13                           post-multiplying the block matrix by a post-multiplication matrix  
14 generated from a second subsample matrix that represents the subsampled  
15 decoding in a second direction that is substantially perpendicular to the first  
16 direction.

17  
18           20. The method in accordance with Claim 19, wherein the method further  
19 comprises the following:

20                   providing the video picture with its one or more reduced size blocks to the  
21 subsample decoder.

22  
23           21. The method in accordance with Claim 19, wherein the method further  
24 comprises the following:

1

subsampled decoding the video picture.

2

3

22. The method in accordance with Claim 19, wherein the method further

4

comprises the following:

5

displaying the subsample decoded video picture on a display device.

6

1           23.     A video management system configured to receive a video stream containing  
2 one or more video pictures that are each divided into blocks, wherein the video management  
3 system is to provide a representation of the one or more video pictures to a subsample  
4 decoder for subsampling, the video management system comprising the following:

5                     means for accessing a video picture; and

6                     means for transcoding the video picture such that subsampled decoding the  
7 reduced size picture results in substantially the same reduced size image as  
8 subsampled decoding the original video picture.  
9  
10



1           24.     A video management system configured to receive a video stream containing  
2 one or more video pictures that are each divided into blocks, wherein the video management  
3 system is to provide a representation of the one or more video pictures to a subsample  
4 decoder for subsampling, the video management system comprising the following:  
5           a memory configured to store one or more video pictures; and  
6           a transcoder configured to perform the following:  
7                 accessing a video picture from the memory;  
8                 for at least one block of the video picture, performing the following:  
9                         representing the block as a matrix;  
10                        pre-multiplying the block matrix by a pre-multiplication matrix, the  
11 pre-multiplication matrix generated from a first subsample matrix that  
12 represents the subsampled decoding in a first direction; and  
13                        post-multiplying the block matrix by a post-multiplication matrix  
14 generated from a second subsample matrix that represents the subsampled  
15 decoding in a second direction that is substantially perpendicular to the first  
16 direction.  
17

FILED FOR E-999999

1 25. A video network comprising the following:  
2 a video management system configured to perform the following:  
3 accessing a video picture;  
4 transcoding the video picture so as to reduce the size of the video  
5 picture without introducing error as measure after subsampling; and  
6 a video node coupled to the video management system so as to receive the  
7 transcoded video picture from the video management system, the video node further  
8 configured to subsample the transcoded video picture; and  
9 a display device coupled to the video node so as to receive the subsampled  
10 video picture, the display device further configured to display the subsampled video  
11 picture.